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☐ 1. Document ID: JP 2001210862 A

L12: Entry 1 of 36 File: JPAB Aug 3, 2001

DOCUMENT-IDENTIFIER: JP 2001210862 A
TITLE: GALLIUM NITRIDE SEMICONDUCTOR LIGHT EMITTING ELEMENT

Abstract (1):
PROBLEM TO BE SOLVED: To provide a gallium nitride semiconductor light emitting element whose leak current is small, whose operation voltage is low, which is superior in light emitting efficiency and whose reproducibility is high.

Abstract (2):
SOLUTION: In the gallium nitride semiconductor light emitting element having PN junction, a cap layer 500 constituted of an Mg doped BGaN semiconductor is formed on an active layer 400.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw Desc | Image

☐ 2. Document ID: JP 2001210861 A

L12: Entry 2 of 36 File: JPAB Aug 3, 2001

DOCUMENT-IDENTIFIER: JP 2001210861 A
TITLE: GALLIUM NITRIDE SEMICONDUCTOR LIGHT EMITTING ELEMENT AND ITS MANUFACTURING METHOD

Abstract (1):
PROBLEM TO BE SOLVED: To provide a gallium nitride semiconductor light emitting element whose leak current is small, whose operation voltage is low, is superior in light emitting efficiency and has high reproducibility.

Abstract (2):
SOLUTION: In the gallium nitride semiconductor light emitting element, an Si doped GaN semiconductor layer 300 as an N-type GaN semiconductor layer, an active layer 400 and an Mg doped GaN semiconductor layer 600 as a P-type GaN semiconductor layer are sequentially laminated. An undoped cap layer 500A is formed between the active layer 400 and the Mg doped GaN semiconductor layer 600 and the cap layer 500A is a GaN semiconductor layer.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw Desc | Image

☐ 3. Document ID: JP 2001035796 A

L12: Entry 3 of 36 File: JPAB Feb 9, 2001

DOCUMENT-IDENTIFIER: JP 2001035796 A
TITLE: MANUFACTURE OF p-TYPE GALLIUM NITRIDE COMPOUND SEMICONDUCTOR

Abstract (1):
PROBLEM TO BE SOLVED: To improve the low-resistance carrier concentration of a gallium nitride compound semiconductor doped with a p-type impurity by heat-treating the semiconductor in the presence of a metal or alloy having a hydrogen occluding ability.

Abstract (2):
SOLUTION: A GaN compound semiconductor 10 and a metal or alloy 11, having a hydrogen occluding ability, are put on top of a sample base. Then a groove 12 for sample which mutually holds the conductor 10 and metal or alloy 11 in a contacting state is provided. At heat treatment, the semiconductor 10 doped with a p-type impurity and the hydrogen occluding metal or alloy 1 are held in a superposedly contacting state. As the hydrogen occluding metal or alloy 11 are included, besides, Zr, single metals, such Ti and Ni, Mg, La, U, Pd, V, etc., and alloys, such as LaNi5, FeTi, Mg2Cu, TiCo, etc. Therefore, since a p-type gallium nitride ohmic contact can be easily formed, a p-type gallium nitride compound semiconductor containing carriers at a high concentration can be formed from a gallium nitride compound semiconductor doped with the p-type impurity.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments
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☐ 4. Document ID: JP 2001007396 A

L12: Entry 4 of 36 File: JPAB Jan 12, 2001

DOCUMENT-IDENTIFIER: JP 2001007396 A
TITLE: III NITRIDE SEMICONDUCTOR LIGHT EMITTING DEVICE

Abstract (1):
PROBLEM TO BE SOLVED: To form a high intensity III nitride semiconductor device by forming a barrier layer comprising polisilicon Si and a buffer layer comprising a III-V compound semiconductor crystal containing boron.

Abstract (2):
SOLUTION: An undoped BP buffer layer 102 is formed on a poly-S layer 101a formed on an Si substrate 101, temperature of the Si substrate 101 is then lowered to convert the surface of the buffer layer 102 into BP0.97N0.03 layer 102a, and an Si doped n-type gallium nitride layer is formed thereon as a lower clad layer 103 followed by formation of an n-type Ga0.88In0.12N light emitting layer 104 of multiphase structure. An upper clad layer 105 of magnesium doped p-type aluminum nitride/gallium mixed crystal is further formed thereon and a pn junction double heterostructure light emitting part 106 is fabricated along with the clad layer 103 and the light emitting layer 104 before an n-type ohmic electrode 107 and a p-type ohmic electrode 108 are formed. Since continuous buffer layer and light emitting layer can be formed on the Si substrate, a III nitride semiconductor optical device having good rectification characteristics and high emission intensity can be fabricated.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments
KWIC | Draw Desc | Image

☐ 5. Document ID: JP 2000150959 A

L12: Entry 5 of 36 File: JPAB May 30, 2000

DOCUMENT-IDENTIFIER: JP 2000150959 A
TITLE: GALLIUM NITRIDE COMPOUND SEMICONDUCTOR LIGHT EMITTING ELEMENT

Abstract (1):
PROBLEM TO BE SOLVED: To suppress the formation of pits in a light emitting layer, which are developed when transition from an underlying layer passes through the light emitting layer, by forming the light emitting layer after a gallium nitride compound semiconductor layer is grown on a first clad layer at a temperature which is different from the growing temperature of the clad layer.

Abstract (2):
SOLUTION: A gallium nitride compound semiconductor light emitting element is constituted in such a way that, after a sapphire substrate 101 is heat-treated in a hydrogen gas flow, the temperature of the substrate 101 is lowered and a GaN (gallium nitride) buffer layer 102 is formed. After the temperature of the layer 102 is successively raised, the layers from an n-type Si-doped GaN layer 103 to the n-type Si-doped GaN layer 105 corresponding to a first clad layer are grown and the GaN pit suppressing layer 106 corresponding to a gallium nitride compound semiconductor layer is grown at a temperature which is different from the growing temperature of the layer 105. After recrystallization, a nondoped InGaN/GaN strained quantum well light emitting layer 107 is grown. Moreover, the layers from the p-type Mg-doped GaN layer 108 corresponding to a second clad layer to a p-type Mg-doped GaN layer 110 are grown.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

☐ 6. Document ID: JP 2000101134 A

L12: Entry 6 of 36 File: JPAB Apr 7, 2000

DOCUMENT-IDENTIFIER: JP 2000101134 A
TITLE: NITRIDE SEMICONDUCTOR ELEMENT AND MANUFACTURE THEREOF

Abstract (1):
PROBLEM TO BE SOLVED: To form ohmic electrodes having good adhesion by a method wherein the surface of a P-type gallium nitride semiconductor crystal layer is subjected to surface treatment with a liquid having a deoxygeneration action and the ohmic electrodes are formed on the surface of the P-type gallium nitride semiconductor crystal layer.

Abstract (2):
SOLUTION: A non-doped GaN layer is formed on a sapphire substrate 1 as a buffer layer 2 by an organometallic vapor growth method. An Mg-doped Al0.1Ga0.9N crystal layer (equivalent to a P-type gallium nitride semiconductor crystal layer 3) is formed on this buffer layer 2 by the organometallic vapor growth method and is used as an intermediate product. After that, gold electrodes 4 are respectively formed on the Mg-doped Al0.1G0.9N crystal layer of the intermediate product by a vacuum evaporation. In such a way, a nitride semiconductor element 5, which is provided with the buffer layer (non-doped GaN layer) 2 formed on the surface on one side of the surfaces of the substrate 1, the P-type gallium nitride semiconductor crystal layer (Mg-doped Al0.1Ga0.9N crystal layer) 3 formed on the layer 2 and the gold electrodes 4 formed on the layer 3, is formed.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

☐ 7. Document ID: JP 11224859 A

L12: Entry 7 of 36 File: JPAB Aug 17, 1999

DOCUMENT-IDENTIFIER: JP 11224859 A
TITLE: DOPING METHOD FOR GALLIUM NITRIDE COMPOUND SEMICONDUCTOR AND MANUFACTURE OF SEMICONDUCTOR ELEMENT

Abstract (1):
PROBLEM TO BE SOLVED: To provide a doping method of a gallium nitride compound semiconductor capable of simultaneously performing doping to plural desired parts of a large area and a manufacturing method of a semiconductor element capable of simplifying a manufacturing process, in the case of manufacturing the plural pieces of the gallium nitride compound semiconductors by using one substrate.

Abstract (2):
SOLUTION: On the substrate 10 composed of sapphire, an undoped AlGaN buffer layer 12, a gallium nitride compound semiconductor layer 14 composed of undoped GaN and an interference layer 16 are laminated. Thereafter, by forming an Mg thin film 18 at a part on the interference layer 16 and heat- treating the substrate 10 for a fixed time interval, Mg is doped only to the part corresponding to the part where the Mg thin film 18 is formed in the gallium nitride compound semiconductor layer 14, and a p-type region 20 is formed. Also by the use of this method, since Mg is doped simultaneously at the desired positions of a large area, the manufacturing process of the semiconductor element provided with a gallium nitride compound semiconductor is simplified.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

☐ 8. Document ID: JP 11087850 A

L12: Entry 8 of 36 File: JPAB Mar 30, 1999

DOCUMENT-IDENTIFIER: JP 11087850 A
TITLE: NITRIDE COMPOUND SEMICONDUCTOR LASER ELEMENT AND LASER DEVICE

Abstract (1):
PROBLEM TO BE SOLVED: To prevent leakage of light of a gallium nitride compound semiconductor laser element by providing a clad layer of a sub-mount or the like at an opposite side to a mounting surface via an active layer in a laminated structure, and a light absorption layer having a smaller band gap than that of the active layer at an arbitrary site between the mounting surfaces.

Abstract (2):
SOLUTION: A semiconductor laminated structure 100 is provided on a low resistance n-type substrate 1. In the structure 100, an n-type GaN buffer layer 2, an n-type AlGaN clad layer 3, a non-doped InGaN active layer 14, an Mg- doped AlGaN clad layer 5, a p-type InGaN light absorption layer 17 having a smaller band gap than that of the layer 14 and a p-type GaN contact layer 9 are sequentially laminated from a side near the substrate 1. Further, a p-type side electrode 10 is formed on an upper surface of the layer 9, and an n-type side electrode 11 is formed on a rear surface of the substrate 1. Thus, leakage of a light from the gallium nitride compound semiconductor laser element can be prevented.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

☐ 9. Document ID: JP 11040891 A

L12: Entry 9 of 36 File: JPAB Feb 12, 1999

DOCUMENT-IDENTIFIER: JP 11040891 A
TITLE: GALLIUM NITRIDE SEMICONDUCTOR LIGHT-EMITTING DEVICE AND MANUFACTURE THEREOF

Abstract (1):
PROBLEM TO BE SOLVED: To form a good crystal by a method, wherein a semiconductor layer doped with magnesium and represented by a formula I is formed, and semiconductor layers which include an active layer and are represented by a formula II are formed on the semiconductor layer.

Abstract (2):
SOLUTION: For instance, a gallium nitride laser is formed through a method, where a gallium nitride layer 115 doped with magnesium and represented by a formula I, AlxGa1-xN (0≤x≤1), is formed on a sapphire substrate 101, and gallium nitride semiconductor layers which include a multi-quantum well structure active layer 107 and are represented by a formula II, InAlGaN (0≤x≤1, 0≤y≤1), are formed. A layer 115 doped with magnesium is excellent in crystallinity, where a locking curve obtained through a double crystal X-ray diffraction analysis evaluation is narrow in full-width at half maximum, so that the layer 115 causes no deterioration in crystallinity to the layers which are formed thereon, including the multi-quantum well active layer 107. With this setup, a gallium nitride semiconductor of high quality can be formed.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw Desc | Image

☐ 10. Document ID: JP 11017222 A

L12: Entry 10 of 36 File: JPAB Jan 22, 1999

DOCUMENT-IDENTIFIER: JP 11017222 A
TITLE: COMPOUND SEMICONDUCTOR LIGHT-EMITTING DEVICE

Abstract (1):
PROBLEM TO BE SOLVED: To prevent variation of conduction types in a light-emitting layer, which is ascribed to the entry of acceptor impurities, by forming an interposed layer and an intermediate layer consisting of a group III nitride compound semiconductor, at a position between an n-type lightemitting layer and a p-type layer consisting of a group III nitride compound semiconductor containing indium.

Abstract (2):
SOLUTION: An interposed layer 109 composed of undoped n-type gallium nitride is formed on a light-emitting layer 104 made of a mixed crystal of gallium nitride and indium. In this case, supply of indium source is stopped from the moment the light-emitting layer 104 is formed, while the other material gasses are continuously supplied. Thereafter, a magnesium-doped gallium nitride layer having high resistance is grown as an intermediate layer 108. Further, an upper clad layer 105 consisting of a mixed, crystal of a magnesium-doped p-type aluminum nitride and gallium is grown on the intermediate layer 108, followed by further depositing thereon a magnesium-doped p-type gallium nitride layer serving as a contact layer 106, thus obtaining a laminated body to be utilized as a light-emitting device.

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